metronome with contact-pieces dipping into mercury-cups at each oscillation, a condenser being placed under the instrument to get rid of the extra current, and so to equalise the physiological effect of the making and breaking currents.

The measurement of induced currents presented considerable difficulties. The Conference at Paris had recommended the use of standard induction-coils, but this method does not give any but arbitrary measures. Dr. Stone had tried and showed a vacuum-tube, in which the tension of air could be varied by combining it with a barometric-column and a movable cistern. This gave a ready means of varying the force of the discharge, by using it as a shunt of variable resistance, and had the interesting results of shunting the "make-current" at a definite point, while allowing the "break-current," which is about six times stronger, to pass between the platinum points; thus obtaining an induced current in one direction only. Latterly he had adopted also condensers of definite capacity charged to definite potentials. The writers were, however, still experimenting with another method, depending on Sir W. Thomson's determinations of spark-length. The most practical method, at present, seemed to be to pass a continuous current of measured strength through an automatic commutator, which at alternate oscillations diverted it in one and the other direction. If there was any real physiological value in rapid reversals of direction, as was claimed by some experimenters, it could thus be secured, without the use of an induction coil. Another form of rotating-commutator was also shown, in which an ebonite cylinder, pressed on by six springs, at each quarter-turn connected, first, the condenser to the battery, so as to charge it, and then discharged it through the patient. To obviate the necessity of employing a large battery with the condenser arrangements, Planté's secondary battery could be charged in parallel position from a small number of Grove's cells, and discharged through the condenser in series. In all these contrivances, however, as the current gained in tension, it seemed to lose somewhat in chemical and catalytic power, and to assimilate gradually to the static form.

In the discussion which followed Mr. Preece pointed out that the use of electricity for curative purposes had been advocated as long ago as the year 1759, by John Wesley, and recommended the use of the dynamometer for the measurement of induced currents, as this instrument gave indications in the same direction with all currents. Prof. McLeod, Mr. Fitzgerald, and Prof. Ayrton also made comments on the paper.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—It is proposed to spend 300*l.* extra within the next three years for the following objects at the Botanic Gardens: thinning the belt and groups of trees; raising the level of some unoccupied areas and sowing them with grass; replanting the willow bed and making new beds; and the improvement of the collection of trees, already good, so as to keep up its special reputation.

Prof. Hughes having expressed to the Vice-Chancellor the serious difficulty found in carrying on practical studies in the Woodwardian Museum without additional class-room accommodation, it is arranged that Mr. Keeping, the curator, shall cease to reside in the museum, and be allowed an equivalent sum for house-rent and other advantages attached to the curatorship.

Prof. Humphry proposes to take classes in Surgery during the Long Vacation.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, January.—A new odontograph, by H. Bilgram.—Dimensions and performance of the hull and machinery of the U.S. steamer *Dispatch*, by chief-engineer Isherwood.—Mechanical drawing, by C. Sellers, jun.—The application of frictional electricity to the purification of middlings, by R. Grimshaw.—On the constants in Gordon's formula for the strength of columns, by M. Merriman.—Chronological table of American patents, by E. Hiltebrand.

Annalen der Physik und Chemie, No. 2.—On the elliptical polarisation of light in reflection at crystal surfaces, by E. Schenck.—Influence of mechanical hardness on the magnetic properties of steel and iron, by L. M. Cheesman.—On the maximum of magnetisation of diamagnetic and weakly-paramagnetic bodies, by H. W. Eaton.—On the reflection of electric rays; the influence of the cathode's form on the distribution of the phosphorescent light in Geissler-tubes; the connection between density of gas and layer-interval in Geissler-tubes; and the band-spectrum of air, all by E. Goldstein.—On the formation of peroxide of hydrogen during combustion, by A. Schudler.—Reply with regard to the formation-heat of water, by the same.—The expansion of water through absorption of gases, by K. Ångström.—Theory of refraction on a geometrical basis, by A. Kerber.—On the minimum of rotation of the light-ray in combined refraction and reflection at a sphere, by F. Kessler.—The minimum of deflection of a light-ray by a prism, and the minimum of time in refraction of light, by the same.—On electric shadows, by P. Riess.

Archives des Sciences Physiques et Naturelles, February 15.—A hypothesis on the origin of species, by M. Thury.—Determination of the quantity of organic substances contained in waters of the Rhône, by MM. Graebe and Guye.—Dry plants found in mummies, by Dr. Schweinfurth.—Study on the chemical composition of albuminoid substances (continued), by M. Danilewsky.—Swiss geological review for 1881, by M. Favre.

Journal de Physique, February.—Thermodynamic acceleration of the earth's motion of rotation, by Sir W. Thomson.—Imitation of the forces acting in a dielectric, by M. Elie.—Electric lighting, by M. Foussereau.—Projection of the focus of the prism, by M. Crova.—On a phenomenon of physiological optics, by MM. Macé de Lepinay and Nicati.

Natura, February.—On the origin of metamera, by G. Cattaneo.—On the origin of electricity of thunder-clouds (continued) by F. G. Nachs.—Some notes on radiophony, by E. Mirabelli.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti, vol. xv. fasc. 1.—*Résumé* of meteorological observations at Milan, in the Brera Observatory, by P. Frisiani.—On linear systems, by E. Bertini.

Fasc. 2.—New indicator, at a distance, of the temperature of an inclosure, by R. Ferrini.—On two nummulitic deposits in the Pavian Apennines, by E. T. Taramelli.—Phosphates and wheat, by G. Cantoni.—On the theory of the diatomic scale, by E. Beltrami.—The double quadratic transformation of space and its application to non-Euclidean geometry of space (continued), by C. F. Aschieri.—Results of observations during 1881 at the Brera Observatory, on the diurnal excursions of the magnetic needle, by E. G. Schiaparelli.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, March 16.—Sir John Lubbock, Bart., M.P., F.R.S., president, in the chair.—Messrs. H. M. Brewer, V. I. Chamberlain, and A. P. Withiel Thomas were elected Fellows of the Society.—Mr. J. Worthington Smith called attention to certain very destructive Australian fungi new to England, viz. *Capnodium australe*, fatal to conifers, especially *Thuyas* and *Isaria fuciformis*, a great pest to grass in Kent and Sussex. The latter plant is popularly supposed to induce a disease similar to diphtheria, and said to be fatal to cattle. *Isaria* frequently grows on animal substances, dead and living, as on larvæ and pupæ of ichneumons, spiders, moths, wasps, &c.—Mr. Smith showed a bee caught alive in this country, and having a profuse growth of the *Isaria*-condition of the *Cordiceps sphecocephala*, a West Indian form, the latter genus being closely allied to *Claviceps*, or Ergot.—Dr. Francis Day read a paper upon the Salmones found in the British Isles, remarking how great changes are occasioned by retaining any of them in unsuitable localities. He objected to the augmentation in number of the British forms of migratory trout, from three to seven, as made by Dr. Günther, holding that we merely possess two. The Lochleven trout, which is in reality a marine form, acclimatized to fresh water, whereas the remainder are solely trout races of the common brook trout.—A most interesting fact was brought forward, viz. that Mr. Arthur, in New Zealand, having lately examined the trout which were introduced there in 1869 from ova originally obtained from the Thames and the west of England, found great structural changes had taken place. The fish in question, moreover, living in different streams in New Zealand had also assumed local peculiarities of size and change of form; and, doubtless due to increased food, the annual increment of weight had risen from $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds, and an example had been seen weighing 20 pounds. The cœcal appendages hitherto held as significant of species were found augmented from 33 to 50, as exemplified in British fish, to from 43 to 54 in the New Zealand examples, therefore showing that these organs are inconstant as to number. Having alluded to the different species, Dr. Day concluded that, as the various species of non-migratory trout, accepted by Dr. Günther, interbreed, and the results classed hybrids are not sterile, such gives increased reason for supposing these various forms are local races, and not different species; that if they are really distinct species division has not proceeded sufficiently far, because the Gillaroo, or form of trout with a thickened middle coat of the stomach, has been termed *Salmo stomachicus*, Günther, whereas the great lake trout with a thickened stomach, and the Charr having a similarly transformed organ, have not yet been differentiated into species. Dr. Day considers that all our non-migratory freshwater trout (including the Loch Leven) are merely local races; that interbreeding will produce mongrels, in which sterility need not be anticipated, while introducing new races (unless in the principle of preventing breeding in and in) will not be of much benefit to fisheries, unless the food is in excess of local requirements, for if not the new-comers will revert to the colour, form, and size of the original tenants of the water.—Two papers by Mr. Charles Darwin—(1) on the action of carbonate of ammonia on the roots of certain plants; and (2) the influence of carbonate of ammonia on chlorophyll bodies were read, abstracts of which appeared in last week's NATURE.—The twelfth part of the Rev. A. Boog Watson's contributions to the mollusca of the *Challenger* Expedition was also read.

Geological Society, March 8.—J. W. Hulke, F.R.S., president, in the chair.—George Clementson Greenwell and John Baldry Redman were elected Fellows of the Society.—The following communications were read:—Additional note on certain inclusions in granite, by J. Arthur Phillips, F.R.S. The author referred to certain rounded inclusions in granite which were rich in mica. These he had described in his paper published in vol. xxxvi. of the *Quarterly Journal*, and had considered to be contemporaneous segregations from the molten rock. He had, up to that time, not found a case where one of the larger crystals of felspar in a porphyritic granite occurred partly in the one, partly in the other. Of late he had seen several, one of which he described minutely, thus proving the correctness of his supposition.—The geology of Madeira, by J. S. Gardner, F.G.S. Madeira consists almost wholly of sheets of basalt lava of variable thickness, interstratified with tuff scoria and red bole, cut by innumerable dykes. In the central part of the island is a horse-shoe-shaped valley, more than four miles in diameter, its bed 2500 feet above the sea, its precipitous walls full 3000 feet high, rising here and there to yet greater elevations, and forming a central point in the mountain system of the island. This the author regards as the basal wreck of a volcanic mountain, blown into the air by an explosion of exceptional violence. Fragments of the slopes of scoriæ, which once composed the inner shell, remain on the peaks surrounding this amphitheatre. The dykes here are trachyte. The author describes a limestone exposed in one place beneath the basalts, and referred to the Upper Miocene, and a plant-bearing bed associated with them, containing fossils of species still living in the islands, some of which have been wrongly referred to extinct forms. In conclusion, the author remarked upon the almost infinite variability of the genus *Robus*, and the difficulty of distinguishing its species.—On the crag shells of Aberdeenshire, and the gravel beds containing them, by Thomas F. Jamieson, F.G.S.—On the red clay of the Aberdeenshire coast, and the direction of ice-movement in that quarter, by Thomas F. Jamieson, F.G.S.

Victoria (Philosophical) Institute, March 20.—A paper on "Climatic Influences as regards Organic Life" was read by Dr. Gordon, C.B., honorary Physician to the Queen.

EDINBURGH

Royal Society, March 6.—Prof. Fleeming Jenkin, vice-president, in the chair.—Dr. Macfarlane communicated the results which he and Mr. D. Rintoul had obtained from experiments on the effect of flame on the electric discharge. A circular disk was supported near a Bunsen burner on an insulating rod, the centre of the disk, which lay in a vertical plane, being on the same level with the top of the burner. The disk could be charged positively or negatively (as desired) from a Holtz machine, and was in electrical connection with a quadrant electrometer, so that the differences of potential necessary for a discharge to take place between the disk and burner could be measured for each of the various experiments made. The effect of varying the distance between the disk and burner was carefully noted amongst other effects; but the most curious results seemed to be the marked difference in the behaviours of the flame under influence of the charged body according as the flame was luminous or non-luminous, or according as the charge was positive or negative. For example, though the non-luminous flame was (broadly speaking) affected similarly by the negative and positive charge, the luminous flame gave very different results in these cases, being drawn *towards* the negatively charged disk as if dominated by a strong blow-pipe blast, but being forced *down* upon the top of the burner when the disk was positively charged. The electrometer readings also showed interesting variations, being in general greater when the disk was charged negatively than when it was charged positively—Mr. J. Macfarlane, B.Sc., read a paper entitled observations on vegetable and animal cells, their structure, division, and history (Part 1). The paper dealt with the cells of Chara, a nucleus, nucleolus, and endonucleolus being shown to be present in all the active cells of the apical bud. After division of the sub-apical cell into node and internode, the former continued to divide, while the latter was completely arrested, though the earlier steps in division were taken, so that by virtue of the steady proliferation of the endonucleous and nucleolus the nuclei in such internodal cells as the third removed from the apex were multinucleolar. These nuclei then divided in the manner figured by Johow, so that the sixth internodal cell might be multinuclear, with multinucleolar nuclei. This same phenomenon was shown to occur in all the cells of the plant. Comparing his results with other observers, the author concluded that during division, the endonucleolus divides first; then the nucleolus, each of the daughter nucleoli forming an important centre of influence round which the nucleoplasm gathers; and finally, the nucleus, depositing in so doing a septum, and forming a nuclear spindle or barrel, which is most evident where the cell is most vacuolated. In reference to this continued activity of the cell-contents after cessation of cell division, which seemed to be universal among plants, relative nutrition was considered an important factor—cells with only a moderate supply of pabulum remaining multinucleolar, and the more highly nourished becoming multinuclear, a state of plant-cells which the author regarded as being commoner than had, even recently, been supposed.—Mr. Patrick Geddes communicated a paper by Mr. F. E. Beddard, B.A., Oxon, on some points in the anatomy of the nervous system of the pond-snails, Planorbis and Lymnæus.—Mr. E. Sang, in a paper entitled "A Critical Examination of Two Cases of Unusual Atmospheric Refraction described by Prof. Vince," argued that, as the drawings represented in their design and perspective nothing that could ever be seen, and as the diagrams and verbal descriptions were not consistent with each other, the well-known phenomena described by Vince were not cases of mirage at all.—Prof. Crum Brown read a description by the patient himself of a case of dyspeptic vertigo, and added in a few sentences the physiological explanation of the curious sensations experienced.

BOSTON, U.S.A.

American Academy of Arts and Sciences, February 9.—President Lovering in the chair.—Prof. A. E. Dolbear exhibited his new telephone. The peculiarity of this instrument consists in the receiver. This is formed of two parallel metallic plates separated from each other by a thin layer of air. One plate is fixed, and is connected with one terminal of a small Ruhmkorf coil; the other plate can vibrate, and is connected with the other terminal of the coil. When a transmitter is placed in the primary circuit of the Ruhmkorf coil, the attractions between the two metallic plates reproduce the sound-waves sent into the transmitter. Conversation has been carried on over 250 miles of land lines and 350 miles of submerged cable with the aid of this instrument.—Prof. F. W. Putman, curator of the Peabody Museum of Archæology at Cambridge, exhibited a number of specimens of pottery of the mound-builders of North America, which illustrated conventionalisms in ancient American art.—An interference prism for producing interference striæ was exhibited by Mr. C. E. Kelley. This consisted of two pieces of glass, separated at one end by one thickness of tinfoil, and at the other by two thicknesses of foil. By sliding the prism in front of the slit of a spectroscope, any suitable number of striæ could be produced.—Mr. N. D. C. Hodges reduced Maxwell's law of distribution of energy among the particles of a gas from the principle of least action.—The following papers were presented by Prof. H. B. Hill, of Harvard University: Dibromacrylic acid; relations of dibromacrylic acid to two different tribrompropionic acids; certain tetra-substituted propionic acids; on the constitution of the substituted acrylic acids.—Dr. Asa Gray, of Harvard University, contributed the following: Studies of Solidago and Aster; *Novitiæ arizonicæ*, &c., characters of new plants chiefly from recent collections in Arizona and adjacent districts.

VIENNA

Imperial Institute of Geology, February 21.—The following papers were read:—F. v. Hauer, on the meteorites of Mocs (Transylvania).—Th. Fuchs, Bathymetrical distribution of the deep-sea fauna.—A. Bitter, on the Tertiary formation of the Vicentinian Alps.—Prof. Szabo, on the principles which enable us to determine the trachytes in their chronological relation.

March 7.—F. v. Hauer, communications on the Rhætic fossils of the Ligurian Alps.—O. Lenz, on a geological map of Western Africa.—V. Uhlig, on the Cephalopod fauna of the strata of Rossfeld.

Imperial Academy of Sciences, March 9.—L. T. Fitzinger in the chair.—The following papers were read:—E. Hering, contributions to general nerve and muscle physiology. Part ix. nerve excitation and nerve current.—R. Schram, auxiliary tables to chronology.—L. Heitinger, preliminary note on glutamic acid and pyrrol.

March 16.—L. T. Fitzinger in the chair.—Ph. Knoll, contributions to the theory of respiratory innervation. Part i. respiration during excitation of the cervical part of vagus by its own current.—T. V. Janovsky, on sulphonic acids of azobenzol.—V. Zepharovich, supplement to the already published crystal forms of some camphor-derivates, especially on the forms of camphor-bibromide.—M. Tüllich, a sealed packet dealing with a mechanical problem.—E. v. Dunikowski, on the Spongia, Radiolaria, and Foraminifera of the Lower Liassic strata of the "Schafberg," near Salzburg.—T. Kachler and T. Spitzer, on two isomeric camphor bibromides from camphor monobromide.—L. v. Pebal, on the use of electromagnets for mechanical separation of minerals.—E. Brücke, on testing urea by oxalic acid.—E. Stefan, on the magnetic screen-action of iron.—K. Ginzel, astronomical researches on eclipses.—A. v. Obermayer, on the diffusion of gases, Part ii.

PARIS

Academy of Sciences, March 20.—M. Jamin in the chair.—The following papers were read:—On some applications of the theory of elliptic functions, by M. Hermite.—Double decompositions of haloid salts of mercury; conclusions, by M. Berthelot.—Note on the use of superphosphates on calcareous soils of the south coast of France, by M. de Gasparin. The practice has sprung up there within the last two or three years; it proves beneficial to natural or artificial meadows. In a commercial superphosphate analysed, the author found two parts, out of twelve, of phosphoric acid, engaged in the state of phosphates insoluble in water; and ten in that of trihydrated phosphate, to which the agricultural effects are due. The lime and part of the iron were in the state of sulphates.—Letter of N. Fuss on large objectives, found by M. Truchot among the papers of Romme, Member of the Convention, by M. Faye. Fuss, an eminent member of the St. Petersburg Academy, consulted by Romme, indicated the limits then attainable, and gave precise calculations, by Euler's method, of a triple objective, 16 inches diameter, of short focus, with six well-conceived oculars. Romme probably meant to excite, by Fuss's letter, the emulation of French opticians, but events made him lose sight of this.—Theory explicative of the climatological *régime* observed in France on the Oceanic coast since 1880, and the disappearance of the sardine on this coast since the same time, by M. Blavier. See our Notes last week. The supposed displacement of the Gulf Stream is attributed to an exceptional quantity of ice in the region of Davis Straits, obstructing the polar current.—On the action of deformation through shock, compared with that through continuous pressure, by M. Marchal.—Observations of the planets 221 and 223, at Paris Observatory, by M. Bigourdan.—On hypercycles, by M. Laguerre.—On the theory of uniform functions of a variable, by M. Mittag-Leffler.—On mechanical integration, by M. Abakanowicz. He describes an apparatus demonstrating the principle of his integrators (a principle lately applied by Mr. Boys).—Relation between the law of Bouguer-Masson and the phenomenon of Purkinje, by MM. Macé de Lépinay and Nicati. This law applies to each of the simple spectral radiations (at least within the limits of experiment). The constant ratio indicated in it is the same for all radiations of wave-length greater than $\lambda = 5 \cdot 12 \times 10^{-5}$ approximately; beyond that, the ratio increases towards the violet.—Observations *à propos* of a recent note, by M. Violle, on the boiling temperature of zinc, by M. Troost. M. Violle seems to have overlooked later experiments by MM. Deville and Troost, which gave a figure (942°) little different from that obtained by M. Becquerel.—On new combinations of nitric acid and acetic acid with ammonia, by M. Troost. He indicates two of each kind, and their properties.—Action of acid solutions on protoxide of tin, by M. Ditte.—Action of ozone on salts of manganese, by M. Maquenne. Ozone easily produces transformation of protoxide of manganese into permanganic acid, conformably to thermal theory; and the transformation is complete.—Heat of formation of sulphocyanic acid and some sulphocyanates, by M. Joannis.—On the clarification of must for manufacture of champagne, by M. Jean. For this it is necessary to determine the amount of tannin which will be made insoluble by albuminoid matters, and the amount necessary to precipitate the whole of the gelatine added in fining. M. Jean uses a titrated solution of iodine for the purpose.—On the Kola nut, or Gourou, or Ombene (seeds of *Sterculia acuminata*, Pal. de Bauvois), by MM. Heckel and Schlagdenhauffen. This nut, playing in Africa a *rôle* like that of *Maté* and *Coca* in America, contains more cafeine than the best coffees, and wholly in the free state; a good deal of theobromine, and a notable quantity of glucose; it has three times the starch of seeds of *Theobroma*, little fatty matter, a special tannin, and a red colouring matter.—On the richness in hemoglobin of the blood of animals living in high regions, by M. Bert. While the maximum quantity of oxygen absorbable by blood of herbivorous mammalia in France is 10 c.c. to 12 c.c. per 100 c.c. of blood, he finds the blood of several animals (lama, alpaca, stag, sheep, &c.) above Paz, Bolivia, which is 3700 m. high, capable of absorbing amounts from 16·2 c.c. to 21·6 c.c. These latter have thus a more abundant store for the requirements of their life.—On pancreatic digestion, by M. Duclaux.—On the existence of segmentary organs in certain isopod crustaceans, by M. Huet.—On the *Macroscincus coctei*, D. B., recently arrived at the menagerie of the Museum of Natural History, by M. Vaillant.—On the crystalline forms of zirconia, and deductions to be drawn from them for the qualitative determination of zircon, by MM. Lévy and Bourgeois.—On the barometric heights of January 17, 1882, and of the year 1821, in the South of France, by M. Vignier.

CONTENTS

PAGE
Origins of English History. By Edward B. Tylor, F.R.S. . . 501
Works on the Microscope 502
Our Book Shelf:—
  Wiesner's "Elemente der Anatomie und Physiologie der Pflanzen" 503
  Bell's "Sounds and their Relations". 503
Letters to the Editor:—
  Conservation of Solar Energy.—E. Douglas Archibald; Dr. C. Wm. Siemens, F.R.S. 504
  Review of "Aristotle on the Parts of Animals"—A Correction — Dr. Benjamin Ward Richardson, F.R.S. 505
  Deep-Sea Exploration in the Mediterranean.—Prof. Henry Hillyer Giglioli 505
  The Basque Whale in the Mediterranean.—Prof. Henry Hillyer Giglioli 505
  Wind Measurements.—C. H. Romanes; Richard B. Prosser . 505
  Vivisection.—The Writer of the Article on "Vivisection"; H. H. Johnston; W. S.; Arthur Nicols 506
  Phænology—An Appeal.—Drs. H. Hoffmann and Egon Ihne . 506
  Rime Cloud observed in a Balloon —Dr. Hermann Kopp . . . 507
  Water in Australia.—F. T. Mott 507
  The Solar Spectrum in a Hail-Storm.—C. H. Romanes 507
  Temporary Retinal Effects.—J. Rand Capron 507
  Specific Heat and Thermal Conductivity.—H. G. Madan . . . 507
  Rookeries.—The Mug 508
  A means of Saving some Lives in Colliery Explosions.—D. Rhys Jones 508
Economic Geology of India 508
Precious Coral. By Prof. H. N. Moseley, F.R.S. 510
Maxim's Self-acting Fire-Extinguishers (*With Illustrations*) . 511
Art Metal Work of Japan 514
Electricity at the Crystal Palace, III. (*With Illustration*) . 515
Notes 517
Our Astronomical Column:—
  The Great Comet of 1881 519
  A New Comet 520
Medical Electricity 521
University and Educational Intelligence 522
Scientific Serials 522
Societies and Academies 522